H25 Dissolving Dentition: The Effects of Corrosive and Caustic Agents on Teeth

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By attending this poster presentation, the participant will become familiar with the chemicals that can be used to erode or dissolve the tissues of the dentition. This research provides an explanation of the chemical break down of the dentition in relation to masking identity.

With the evolution of forensic technology, methods for positive identification are becoming increasingly accurate. New methods allow for a corpse to be identified at almost any point of decomposition. The new technology and methodology has led to a more creative and resourceful criminal, and as criminals become more forensically aware their methods of disposal change. Although few cases have been documented where chemicals are the mode of body disposal, this method provides a seemingly fool proof and effective approach to disposal. Several household chemicals contain harmful agents that when used can result in the masking of identity. The purpose of this pilot study is to indicate which chemicals can be used in order to erode or dissolve the dentition, and what type of damage each chemical causes to dentition.

A local oral surgeon provided 20 adult human anterior and posterior teeth. Quantitative measurements of weight (g), crown width (mm), and tooth length (mm) were obtained for each tooth. Qualitative observations were recorded using digital imaging as well as photographs under a stereoscopic microscope. A small hole was drilled through the root of each tooth to allow for a wire to be inserted through the tooth. The five chemicals used in this project were muriatic acid (hydrochloric acid), sulfuric acid, potassium hydroxide, and two concentrations of sodium hydroxide, purchased through a local home improvement store and Fisher Scientific. The molar concentration of the chemicals purchased through Fisher Scientific (potassium hydroxide, sodium hydroxide and sulfuric acid) was similar to the concentrations found in common household cleaning products. Eighty milliliters of each chemical was poured into a 100 ml beaker and assigned a letter. Four teeth were submerged into each beaker, with the chemical solution only covering the enamel portion of the tooth, thereby mimicking the surfaces that would normally be exposed had the teeth remained in the alveoli. To quantify and record the corrosive effects of the chemicals, measurements and images of the dentition were taken at two-hour intervals for a total of 8 hours. During this time the chemical solutions were not replenished.

Although all the chemicals tested demonstrated some level of dental destruction, the muriatic acid (hydrochloric acid) proved to be the most effective chemical in this experiment. Interestingly, the dentition submerged in muriatic acid showed a dramatic decrease in weight during the first two measurement periods. The authors hypothesize that this decrease in weight slowed as the chemical reaction subsided and the chemical degraded due to air contact and evaporation, suggesting that the most damage occurs during the first part of contact. After two hours of submersion the enamel of the dentition exposed to muriatic acid had dissolved, leaving the exposed dentin to slough off in sheets with only the organic component remaining. The dentition submerged in sulfuric acid showed some etching on the enamel surface, and at the end of the experiment the enamel surface had a white, powdery appearance (most likely the result of the breakdown of inorganic components of the enamel). The dentition exposed to the potassium and sodium hydroxide solutions showed minimal to no damage. Of all the chemicals tested in this pilot project the dentition exposed to muriatic acid left distinguishing marks and unique pattern on the dentition. With further investigation and analysis it may be possible to specifically isolate these characteristics as being unique to muriatic acid as well as other concentrations of hydrochloric acid.

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